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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/300,494	04/28/1999	ARTHUR ROBERT CALDERBANK	CALDERBANK-1	4523

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EXAMINER

FAN, CHIEH M

ART UNIT

PAPER NUMBER

2634

DATE MAILED: 09/16/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)
	09/300,494	CALDERBANK ET AL.
	Examiner	Art Unit
	Chieh M Fan	2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 21 May 2002.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 3-8 and 11-20 is/are pending in the application.

4a) Of the above claim(s) 11-14 is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 3-8 and 15-20 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:

1. Certified copies of the priority documents have been received.

2. Certified copies of the priority documents have been received in Application No. _____.

3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____.
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.	6) <input type="checkbox"/> Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: it is not clear which equation the “equation (40)” described in line 3 of page 10 is referred to because there is no equation that is numbered 40 throughout the disclosure.

Appropriate correction is required.

Claim Objections

2. Claims 3-8 and 17-20 are objected to because of the following reason:

Regarding claims 3-8, the applicant indicated in the latest amendment that the limitation “and each carrying out channel coding followed by space-time coding” in claim 3 (see the marked-up copy of the latest amendment), but the clean version of the claim 3 never shows such limitation. Further, “said space time-encoder” in line 5 of claim 4 should be “said space-time encoder”.

Regarding claims 17-20, it appears that the limitation “ $i=1,2,\dots,L$ ” in line 1 of claim 17 should be placed after the limitation “at rate R_i ” in line 2. Further, the examiner suggests the following changes so as to be consistent with the terminology “channel coding encoders” used in line 4 of claim 15:

“channel coder” in line 1 of claim 17 should be “channel coding encoder”;

“channel coders” in line 2 of each of claims 17-19 should be “channel coding encoders”;

“channel code encoder” in line 1 of claim 20 should be “channel coding encoder”.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 4-8 and 16-20 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. As shown in the drawings of the instant application, a pulse shaper (43 or 53 in Fig. 2) is directly coupled to the space-time encoder (42 or 52 in Fig. 2). The specification never teaches a modulator coupled between the space-time encoder and the pulse shaper. Therefore, the limitation “a modulator responsive to said space-time encoder, pulse shaping circuitry responsive to said modulator” in claims 4 and 16 has no support in the specification.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 7, 8, 18 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites the limitation "said channel code encoder" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim 8 recites the limitation "said channel code encoder" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claim 18 recites the limitation "said L channel coding/space-time coding transmitters" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim 19 recites the limitation "said L channel coding/space-time coding transmitters" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 3, 4 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calderbank et al. (US Patent 6,127,971, "Calderbank" hereinafter) In view of Naguib et al. ("Space-Time Coded Modulation for High Data Rate Wireless Communications", IEEE, 03/11/1997, "Naguib" hereinafter).

The following rejection of claim 3 is based on the marked-up version in the latest amendment.

Regarding claims 3 and 15, Calderbank (different inventive entity) teach a transmitter comprising:

A demultiplexer (100 in Fig. 1) responsive to an input signal for developing a plurality of at least two signal streams, and

A like plurality of space-time coding transmitters (see 110, 110-1, 110-2, 120, 120-1, 102-2, 130, 130-1, and 130-2 in Fig. 1), each responsive to a different signal stream of said plurality of signal streams.

Calderbank does not teach a respective channel coder coupled in front of each of the space-time encoders 110, 120, and 130.

However, Naguib teaches that, in the same field of endeavor, a Reed Solomon block encoder coupled in front of a space-time encoder (see Fig. 5). The Reed Solomon block encoder is used as an outer code. Naguib further teaches that the reason for using an outer block code is, at reasonable values of SNR, when only the space-time code is used, most of the frame errors are due to very few symbol errors per frame, most of which can be recovered by the use of an outer block code (see lines 1-7 under section 3.2 of page 105).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to couple a respective channel coder in front of each of the space-time coders 110, 120 and 130 of Calderbank, as taught by Naguib, so as to correct frame errors.

Regarding claims 4 and 16, Calderbank further teaches each stream of data is input to a pulse shaper and a modulator before transmitted (see col. 3, lines 39-41). Therefore, each of the transmitters 110-1, 110-2, 120-1, 120-2, 130-1 and 130-2 implicitly includes a pulse shaper and a modulator. Calderbank also teaches a plurality of antennas coupled to the transmitters 110-1, 110-2, 120-1, 120-2, 130-1 and 130-2.

9. Claims 7, 8 and 20 rejected under 35 U.S.C. 103(a) as being unpatentable over Calderbank et al. (US Patent 6,127,971, "Calderbank" hereinafter) In view of Naguib et al. ("Space-Time Coded Modulation for High Data Rate Wireless Communications", IEEE, 03/11/1997, "Naguib" hereinafter) as applied to claims 3, 4, 15 and 16 above, and further in view of Gray (US Patent 5,931,968).

Calderbank in view of Naguib teaches the claimed invention except that the channel coder performs trellis encoding or convolutional encoding (Calderbank in view of Naguib specifies that the channel coder performs Reed Solomon encoding). However, the use of Reed Solomon encoding, trellis encoding or convolutional encoding as a channel encoding scheme is well known in the art. Gray teaches that Reed Solomon encoding, trellis encoding and convolutional encoding may be interchangeably used as an error-encoding scheme (col. 4, lines 20-25). Further, the advantage of trellis

or convolutional encoding, such as enhancing noise immunity, is also well known in the art. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use trellis encoding or convolutional encoding as the channel coding scheme for the advantage of enhancing noise immunity.

Response to Arguments

10. The finality of the rejection of the last Office action is withdrawn.

11. Applicant's arguments with respect to claims 3-8 and 15-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M Fan whose telephone number is (703) 305-0198. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (703) 305-4714. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Application/Control Number: 09/300,494
Art Unit: 2634

Page 8

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4750.

Chieh M. Fan
Chieh M Fan
Examiner
Art Unit 2634

cmf
September 12, 2002